

Additional Activities

A significant amount of meaningful work that is essential to implementation of a holistic solution is currently underway and being accomplished by State of Oklahoma agencies and universities, the U.S. Environmental Protection Agency (EPA), the Department of Interior, Tribes, communities, and other local interests groups.

Recognizing the importance of the Ongoing Activities, the strategy adopted during the reconnaissance phase was to begin to identify short- and long-term Additional Activities that would complement Ongoing Activities.

Potential Additional Activities¹

The Additional Activities component of the Watershed Management Plan would address the following high priority problems identified by the public, local communities, the State of Oklahoma, Tribes, Federal agencies, and Congressional interests that are beyond the scope of the current Ongoing Activities discussed in Appendices C and D:

- Mine hazards, including potential subsidence in populated areas and major road corridors, open and/or poorly sealed mine shafts, and open boreholes
- Stream corridors with impacted ecosystems and corridors subject to flooding in the Picher – Cardin area
- Acid mine drainage along the southern edge of the intensively mined areas in the vicinity of the Tar Creek and Lytle Creek confluence
- Flooding at Miami

In addition, it is important to note, activities by the Agency for Toxic Substances and Disease Registry (ATSDR)²; human health and ecological assessments being performed by the EPA; Tribal risk assessments; and natural resource damage assessments (40 CFR Part 11) being performed by Oklahoma, Kansas and Missouri will provide health-related information to help define appropriate construction techniques.

The Ongoing and Additional Activities would collectively result in a comprehensive solution to high priority problems. Maps showing the general locations of Ongoing and Additional Activities in the Tar Creek and Lower Spring River watersheds are shown in the following two Figures.

¹ The Additional Activities were identified based on public, stakeholder, and Congressional interest input; existing information; and professional judgment. The candidate alternatives identified in the reconnaissance phase Watershed Management Plan will need to undergo additional screening level development and evaluation and comparison with other alternatives during potential follow-on plan formulation activities. It is envisioned that cost-effectiveness and incremental cost analysis techniques, similar to the techniques used by the U.S. Army Corps of Engineers for ecosystem restoration projects, could potentially be used to help identify final efficient solutions.

² The 2004 ATSDR Report to Congress and other pertinent information will be included in Appendix F when it becomes available.

TAR CREEK WATERSHED

THE BUREAU OF INDIAN AFFAIRS

! SALE OF NATIVE AMERICAN MARKETABLE CHAT

THE OKLAHOMA PLAN FOR TAR CREEK

(At Select Locations in the Elm Creek, Upper Tar Creek, Lower Tar Creek, and the Quapaw Creek Sub-Regions)

! IMPROVE SURFACE WATER QUALITY

! REDUCE EXPOSURE TO LEAD DUST

! REDUCE MINE HAZARDS

! RECLAIM LAND IMPAIRED BY MINING

ADDITIONAL ACTIVITIES

Additional Activities; when integrated with On-going Activities by the State of Oklahoma, Environmental Protection Agency, Department of Interior, Tribes and other local interest groups; would result in a comprehensive solution to high-priority watershed problems.

① MINE HAZARDS

If analysis indicates the potential for subsidence is a serious threat then evaluate and compare various alternatives to determine cost effective solutions. Prioritize and seal mine shafts and boreholes.

② IMPACTED STREAM CORRIDORS

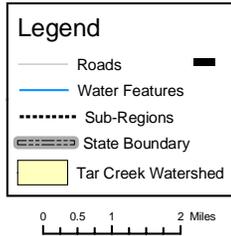
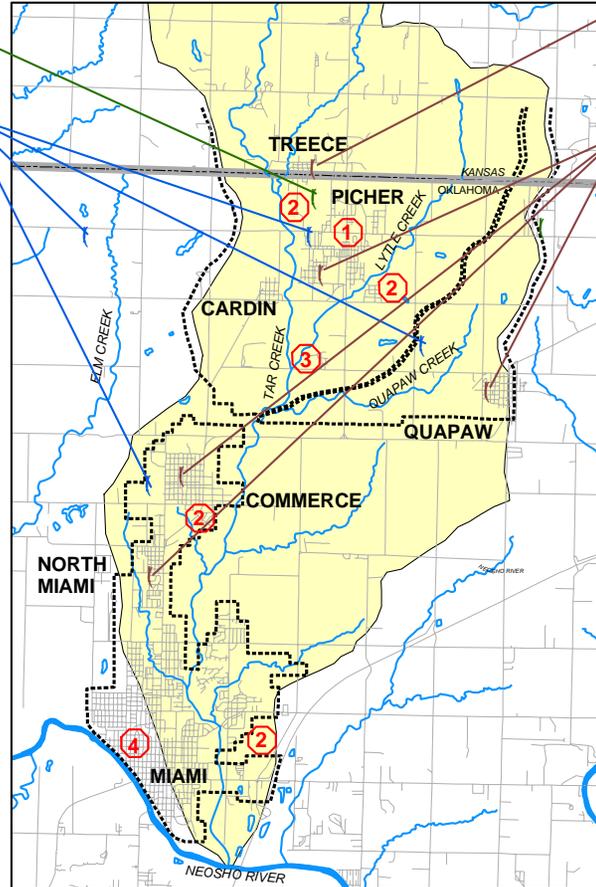
(i.e. flooding at Picher and Cardin /degraded ecosystem)
Conduct a geomorphology assessment of the Tar Creek watershed. North of Highway 69 conduct a coordinated Agency effort within a defined floodplain to seal mine-shafts, remove mine waste, construct acid-mine drainage barriers, and re-construct and vegetate the defined floodplain. South of Highway 69 remove contaminated sediment, if required, and install various structural and non-structural measures to assure a stable channel morphology. This activity would be synchronized with resolving the mine drainage problems in the vicinity of the Tar Creek and Lytle Creek confluence and the Mayer Ranch site at Commerce.

③ MINE DRAINAGE

(along the southern edge of the intensively mined area)
Reduced acid mine drainage using groundwater and/or surface water control techniques and treat residual acid-mine drainage using a variety of passive and/or active techniques.

④ FLOODING AT MIAMI

Reduce flooding using structural (levee, improved channel, detention) and/or non-structural (buy-out flood-prone properties) methods.



U.S. ENVIRONMENTAL PROTECTION AGENCY (REGION 7)

! THE REMEDIATION OF 41 PROPERTIES AT TREECE, KANSAS IS COMPLETE.

U.S. ENVIRONMENTAL PROTECTION AGENCY (REGION 6)

! OPERABLE UNIT 1

The construction of structures to divert surface water around abandoned mines and collapsed mine shafts is complete. The plugging of eighty-three abandoned wells to address the threat of contamination of the Roubidoux Aquifer is complete. On-going activities include monitoring and plugging five additional water wells.

! OPERABLE UNIT 2

The remediation of over 2,000 residential properties, daycares, schools, parks, and business properties in Picher, Cardin, Quapaw, Commerce, North Miami, and Miami is underway.

! OPERABLE UNIT 3

The disposal of 120 deteriorating containers of lead recovering chemicals at Cardin is complete.

! OPERABLE UNIT 4

Identify alternatives to remedy the release or threatened release of hazardous substances, pollutants, or contaminants at or from chat piles, chat bases, flotation ponds, and transition zones.

OTHER WATERSHED INITIATIVES

- U.S. GEOLOGICAL SURVEY (USGS)
The USGS is developing an interactive surface and groundwater model that will be used to help determine the cumulative impacts of various projects.
- GOVERNOR HENRY'S RELOCATION PLAN
Relocation assistance will be provided to families in the most affected area with children age 6 and under.
- AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR)
ATSDR is conducting a health risk assessment.
- GRAND GATEWAY ECONOMIC DEVELOPMENT AUTHORITY (GGEDA)
GGEDA has implemented a lead paint abatement program.
- OTHERS ?

SPRING RIVER WATERSHED

A concern in Kansas and Missouri is contaminated sediments in the Spring River Watershed. Contingent on approvals, this problem could be addressed in future development of the Watershed Management Plan.

U.S. ENVIRONMENTAL PROTECTION AGENCY (REGION 7)

! COMPLETED AND ON-GOING RESPONSE ACTIONS IN CHEROKEE COUNTY, KANSAS AND JASPER COUNTY, MISSOURI

THE BUREAU OF INDIAN AFFAIRS

! SALE OF NATIVE AMERICAN MARKETABLE CHAT

THE OKLAHOMA PLAN FOR TAR CREEK (BEAVER AND ONTARIO / HOCKERVILLE CREEK SUB-REGIONS)

- ! IMPROVE SURFACE WATER QUALITY
- ! REDUCE EXPOSURE TO LEAD DUST
- ! REDUCE MINE HAZARDS
- ! RECLAIM LAND IMPAIRED BY MINING

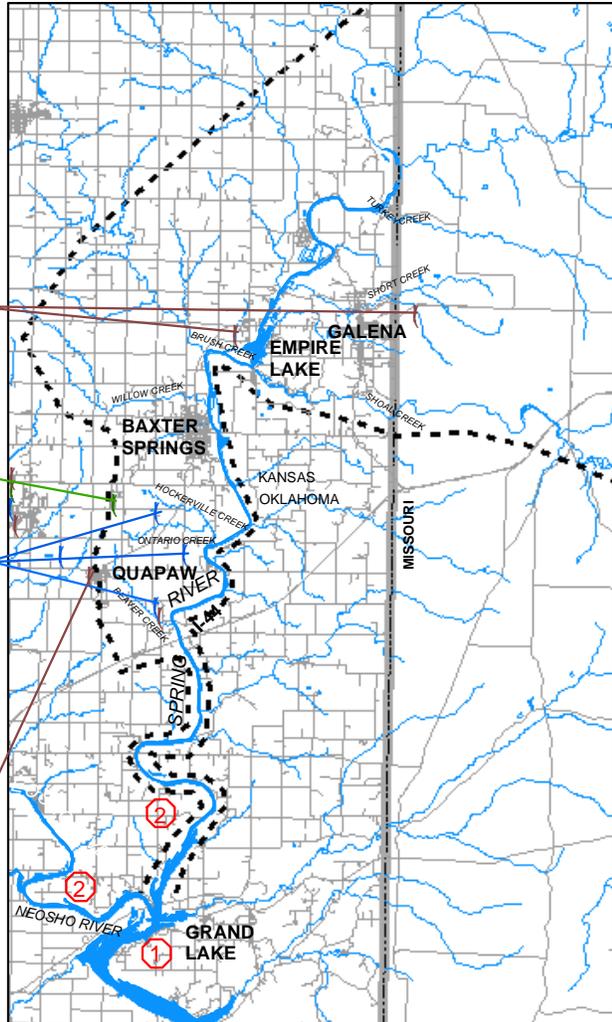
U.S. ENVIRONMENTAL PROTECTION AGENCY (REGION 6)

! OPERABLE UNIT 4
Identify alternatives to remedy the release or threatened release of hazardous substances, pollutants, or contaminants at or from chat piles, chat bases, flotation ponds, and transition zones.

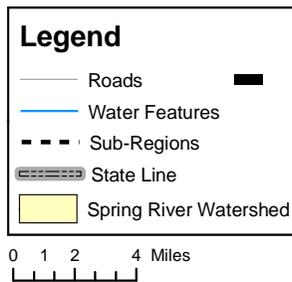
ADDITIONAL ACTIVITIES

- ① Obtain a depositional history of metal loading to Grand Lake.
- ② Determine the current loading and monitor future loading of metals from the Spring and Neosho Rivers during the cleanup of the Picher-Cardin area

Once the impacts are determined, additional measures would be considered at a later date.



A concern in Oklahoma is downstream impacts to the Lower Neosho River Watershed, which includes Grand Lake and the Lower Spring River Watershed.



Surface Water, Groundwater, and Chemistry

Of particular interest is the hydrogeology of the Tar Creek and Lower Spring River area. Without a rudimentary understanding of how surface water, groundwater, and water in the open mine workings interact, accurate engineering designs to address contaminated mine drainage, potential subsidence, and disposal of large amounts of mining waste will be extremely difficult to achieve and likely result in costly mistakes. A three-dimensional model of the ground and surface water systems within the watersheds between the Spring and Neosho rivers is being developed by the U.S. Geological Survey. The model represents a synthesis of these complex flow systems that are integrally tied to the subsurface mine workings. A major benefit of the model is that it can be used to simulate the long-term hydrologic consequences of proposed remedial activities (such as the emplacement of chat within the subsurface mine workings) and is a cost-effective tool for evaluation of activities prior to implementation. The model will provide a basis to evaluate optimal pumping and dewatering strategies to control mine-water discharge and for development of subsequent transport models of the Tar Creek site. The following Table provides a preliminary cost estimate for USGS modeling and related monitoring over a period of 6 years.

USGS Hydrologic Modeling

	Budget X100,000						TOTAL
	Y1	Y2	Y3	Y4	Y5	Y6	
Drill and core 20 wells in the Roubidoux aquifer	0.730	0.730					1.459
Conduct hydraulic tests in the Roubidoux aquifer in 20 wells	0.124	0.124					0.247
Continuously record and report real-time water levels in the Roubidoux aquifer in 20 wells		0.368	0.133	0.133	0.133	0.133	0.898
Corroborate water-use data	0.115						0.115
3D seismic of mining area with report	0.947	0.947	0.947				2.840
Refine mine geometry and delineation	0.124	0.124	0.015	0.015	0.015	0.015	0.308
Obtain water-quality information and age-date water in Roubidoux aquifer in 20 wells			0.115				0.115
Refine and calibrate Modflow model	0.133	0.133	0.133	0.103	0.103	0.072	0.675
Apply Modpath to Modflow Model	0.109	0.109	0.109	0.036	0.036	0.036	0.434
Optimization model with report	0.121	0.121	0.121	0.024	0.024	0.024	0.434
PHAST equilibrium transport model		0.302	0.308				0.609
Water-quality data collection for PHAST model	0.151	0.151					0.302

Surface Water Gages and Water-Quality Monitoring

Construction of gages on Lytle and Tar Creeks at Kansas State line (SW and QW)	0.205						0.205
Develop water-quality surrogates at four gages	0.072	0.072	0.072				0.217
Operation and maintenance of six SW and QW gages	0.253	0.253	0.253	0.253	0.253	0.253	1.520
Surface-water model to predict loads and runoff			0.247	0.247	0.247		0.742
	3.081	3.431	2.451	0.811	0.811	0.534	11.119

The following sections in this Appendix contain preliminary information on strategies, alternative solutions, and preliminary cost estimates to address mine hazards, impacted stream corridors, acid mine drainage, and flooding at Miami.